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Ciula, Arianna; Eide, Øyvind; Marras, Cristina; Sahle, Patrick

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Modelling: Thinking in Practice. An Introduction

Arianna Ciula, Øyvind Eide, Cristina Marras & Patrick Sahle [*]

Abstract: *»Modellieren: Denken in Anwendung. Eine Einführung«*. In this introduction of the HSR Supplement "Models and Modelling between Digital and Humanities - A Multidisciplinary Perspective" we refrain from providing a normative definition of 'model' and 'modelling' and rather attempt at encircling the current state of the art. In the first instance this chapter provides a very brief overview on modelling as intended as a research strategy applied to scientific fields in the 20th-21st centuries. This overview is followed by a short introduction to modelling in digital humanities, focusing on how modelling has developed into a practical strategy and how it has been theorised. The third part of the introduction presents the scope of the project "Modelling between digital and humanities: Thinking in practice". The aim of a project workshop held in 2017, of which this volume collects the proceedings, was to present a multitude of modelling practices from various disciplines together with different theoretical frameworks. The fourth part of this introduction offers an overview of each of the papers in this volume. Finally, a fifth section constitutes the first item of the proceedings as it reproduces an adaptation of the dialogue which was performed to introduce the main topics of the workshop and the scope of the project at the event itself. It serves to illustrate the way we organised the workshop and how the exchanges amongst participants were facilitated.

Keywords: Modelling, Digital Humanities, Multidisciplinarity, Visualization.

[*] Arianna Ciula, King's Digital Lab, King's College London, Virginia Woolf, 22 Kingsway, London WC2B 6LE, United Kingdom; arianna.ciula@kcl.ac.uk.
Øyvind Eide, Institut für Digital Humanities, Universität zu Köln, Albertus Magnus Platz, 50923 Köln, Germany; oeide@uni-koeln.de.
Cristina Marras, Istituto Lessico Intellettuale Europeo e Storia delle Idee, Consiglio Nazionale delle Ricerche, via Carlo Fea 2, 00161 Roma, Italy; cristina.marras@cnr.it.
Patrick Sahle, Cologne Center for eHumanities, University of Cologne, Albertus Magnus Platz, 50923 Köln, Germany; sahle@uni-koeln.de.
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1. Modelling in the Sciences

Models and modelling as explicit explanatory, exploratory and empirical strategies of inquiry have been increasingly recognised and adopted in science and scholarship over the last decades. Popular examples of influential models in the natural sciences include the Bohr model of the atom, the double helix model of the DNA, and the Lotka-Volterra model of predator-prey interaction, whereas in the social sciences rational actor based models of economic transactions and actor-network models have been of key importance. Economic and climate models have also gained significant societal relevance and are at the core of political discussions. Society macro-planning and policy making are partly based on complex economic models, and climate models are increasingly used to justify resource planning at all scales, from municipalities to continents. Thus, scientific models are not only important in their respective research domains but are also adapted and adopted extensively in public policy planning and are prominent elements of the public discourse.

In contrast to its ubiquity, the concept of model is hard to define. Quite different things are called models: from physical and fictional objects through set-theoretic structures to mathematical equations, as well as combinations of some or all of these. Models are understood to be not just static representations but rather tools for interactive inquiry. Models and the process of modelling feature a number of often mixed ingredients, including different forms of expressions such as mathematical formalism and visual diagrams, as well as a variety of conceptual devices such as theoretical ideas, policy views, and metaphors. Models as computational construals can also embody quite different forms. To complicate matters, processes of translation between multiple expressions and conceptual worlds, such as abstraction and idealisation, make modelling a slippery practice to pin down conceptually. Typically, modelling is not linear. It is rather a complex iterative process of integration and exploration with repeated loops of testing, feedback and adjustment.

The relationship between models and their "targets", that is the objects or systems being modelled, is complex and hard to define, as is the nature of the target object or system itself (Gelfert 2016, 93). The scientific understanding of this relationship varies across research traditions and has developed significantly over time. In the 20th century, models have been described as as representations of their targets and the specific nature of the representations did not attract much attention until the latter part of the century. This has changed over the last decades, but the categories used to describe models, such as idealised models or phenomenological models, are still somewhat vague and the borders between them not clear. Furthermore, in philosophy of science, a pragmatic view on modelling has emerged over the last decade, in which the relation between a model and its target, traditionally expressed as representation in the form of formal, structuralist or syntactic morphism (such as isomorphism), is

being replaced by emphasizing a pragmatic relationship, often simply described as a situation where somebody creates a model of something with some purpose (Gelfert 2016, 113).

Traditionally, prediction and reproduction of results, as well as explanation of observations, have been the main phases of the scientific method in which models in the sciences have been created and evaluated. More recently the creation and use of models to explore rather than measure, predict, or explain have also gained recognition in the philosophy of science.[1] All these functions are associated with what is considered the purpose of models, which is to support analysis and discovery as well as to enhance learning and understanding. Models are indeed considered to be better suited to learn something new about the target systems or objects for several reasons. Their creation and manipulation support surrogative reasoning, where aspects of the system under study are sharpened up in the model and hence made more "observable" than by studying the target systems or objects directly. The novel concept of model-based reasoning captures exactly this.

Learning from models can take place at two different stages, in the creation of the model and in its application and successive manipulation; that is, through changing it and observing the effects and reactions. Further, it can take place through physical experiments, thought experiments, and simulations. Of key importance is the fact that models often serve an exploratory function in research: as a starting point to test an hypothesis, as proof of concept, to generate potential explanations to a theory, and to assess what the target system is and how its salient features can be observed in separation from background noise (in cases where a firm theoretical understanding is not yet established, cf. Gelfert (2016, 93). Explanatory, experimental and explorative functions are distinct and central to model based scientific exploration, but they are neither mutually exclusive nor exhaustive.

The philosophy of science literature has been the venue of extensive debates on how models relate to theories.[2] This discussion is entangled with the difficulty of distinguishing between model and theory. From the logical positivist tradition philosophers of science have inherited the syntactic view, where models are understood in a mathematical sense as tools with which to perform calculus. In this view, where theories are seen as a set of propositions expressed in first order logic, models are seen as having limited importance for science. The semantic view goes in the opposite direction, claiming that theories should be seen as families of models. Here, formal calculus is removed from the core role it plays in the syntactic view. Beyond these views there is the position that models are independent both from theories and from the target systems or objects, being rather "autonomous agents". For example, according

[1] See e.g. Gelfert (2018, 245).
[2] See e.g. an overview in Frigg and Hartmann (2018).

to Morrison and Morgan (1999) models are autonomous in that they are not placed between a theory and the physical world but rather outside the theory-world-axis, enabling models to mediate effectively between the two.

2. Modelling in the Digital Humanities

The use of models and modelling also has a long tradition in the humanities. Indeed, going back to early modern European research the use of models in what could be called, pragmatically, "the humanities" included modelling in natural philosophy, which later developed into the natural sciences. The long history of modelling is complex due to the only partial overlap between the concepts of model and modelling then and what we consider as modelling practices today.

Nevertheless it is fair to say that the explicit use of the word "modelling" in humanities research has increased significantly with the introduction of Digital Humanities (hereafter DH), where modelling is considered one of the core research practices (McCarty 2005, 20-72; Buzzetti 2002; Beynon et al. 2006). The high reliance on modelling in this discipline is due to the fact that explicit models are extensively required in DH in order to operationalise research questions. This operationalisation process includes representation of objects of study in the form of data to process, in order to make objects and observations computable, as well as to analyse, transform and visualise data. The practice of modelling in DH is theorised mainly around understandings of modelling in the techno-sciences and computer science in particular (Flanders and Jannidis 2015), although some reference works in the field also take into account other research traditions from the humanities, social sciences and informatics (McCarty 2005, 2009; Mahr 2009). A key aspect of modelling in DH is the focus on interactive use of computers and on studying the modelling process with the aim of learning from it. The highly self-reflective arm of DH research, that some call a meta discipline to the humanities, engaged in assessing the epistemological impact of information technology and software engineering in research, calls for a shift from models as static objects (e.g. what functionalities they enable) to the dynamic process of modelling (e.g. how were models built and used and for what purpose, what constraints they embed, what effect they have in refining research questions).

Models as they are used in science and scholarship are representations – in the form of manipulable construals – of something which are created for the purpose of studying that something or what is modelled (what above was referred to as "target" following the tradition in philosophy of science). However, the relationship between model and modelled object is more complex than static representational understandings have allowed for. Only recently model-

making has been theorised within a semiotic framework (Knuuttila 2010; Kralemann and Lattmann 2013; Marras and Ciula 2014).

In DH as in other scientific settings, modelling can be considered a creative process of reasoning in which meaning is made and negotiated through the creation and manipulation of external representations. The specific ambition of research in DH, however, is to make scholarly arguments operational via the creation and manipulation of digital models. Making external representations to reason with has been part of the scholarly Western tradition at least since the Enlightenment; DH extends this practice by actively creating and processing digital artefacts in different media.

In the DH context models are always created with the objective of been operationalised. This means that they are created in a way so as to lend themselves to be used and manipulated in a computational setting. However, the form models take can vary extensively, from a formal schema, to the logics informing the running of code (programs or apps) as well as to digital objects such as maps or 3D models. Such frameworks can be local to one institution, one project, or even to one single researcher, but can also be generalisable and scalable, as we see in the development of common formalisms or standards such as the recommendations of the *Text Encoding Initiative* (TEI) guidelines to encode textual sources. Modelling in DH is also akin to similar processes adopted in the area of cultural heritage documentation. The latter has traditionally focused on database development and associated documentation standards; dating back to the 1990s there has also been a development of formal ontologies, exemplified by CIDOC-CRM.[3]

What modelling in the (digital) humanities and (digital) cultural heritage have in common is partly the source or objects for the models (in general cultural artefacts of some kind) and partly the aim of the whole modelling enterprise. While in, e.g., physics the target of modelling activities are aspects of the physical world and the goal is the establishment of general laws, in the humanities and cultural heritage modelling targets tend to be human creations and the goal of the modelling is often to describe idiosyncratic phenomena or artefacts of human creation, acknowledging and valuing subjectivity as part of the modelling process. Often the objective is to express principles grounded to specific contexts rather than general laws.

3. Our Research Project on Modelling

Scholarly modelling as a formal and informal reasoning strategy across disciplinary boundaries was the core of the collaborative Project "Modelling be-

[3] See Ciula and Eide (2014).

tween digital and humanities: Thinking in practice"[4], funded by the Volkswagen Foundation under the programme "Original, isn't it? New Options for the Humanities and Cultural Studies," Funding Line 2 "Constellations" (2016-2017), from April 2016 to July 2018. The workshop, the proceedings of which are collected in this HSR Supplement, was one of the milestones of the project.

This collaborative project connected the research threads of the four Principal Investigators (PIs) and editors of this volume – Arianna Ciula (Department of Humanities, University of Roehampton, UK, until January 2017; King's Digital Lab, King's College London, UK, from February 2017 onwards), Øyvind Eide (University of Passau, DE, until March 2017; University of Cologne, DE, from October 2015 onwards), Cristina Marras (CNR-ILIESI, Rome, IT), and Patrick Sahle (University of Cologne, DE) – freeing them partially from other duties at their own institutions or allowing them to hire research assistants and associates[5] to take part in the research and to coordinate common efforts, including the organisation of the workshop in Wahn.

Through the lenses of critical humanities traditions and interdisciplinary takes on making and using models, the project built on the novelty of DH research in making explicit and integrating existing diverse models of cultural phenomena such as texts and events. Its originality laid in using DH research to explore possibilities for a new interdisciplinary language of modelling spanning the humanities, cultural studies and the sciences; to analyse modelling in scholarship as a process of signification; and to develop connections between modelling as research and learning strategies.

The following was used as working definition of modelling within the project: modelling is the creative process by which researchers create and manipulate external representations ("imaginary concreta", Godfrey-Smith 2009) to make sense of the conceptual objects and phenomena they study. To integrate the theories summarised in the section above with a practical dimension, the project made use of DH as an interdisciplinary departure to study modelling as anchored both to computer science and to the humanities. The project aimed to link scholarly modelling as a formal and informal reasoning strategy across disciplinary boundaries, spanning also social, life and techno-sciences, and bridging across modelling in research and in teaching.

Building on complementary expertise in DH research, the PIs aimed at reflecting on modelling around the central concept of textuality. Textuality stands

[4] <http://modellingdh.uni-koeln.de>.

[5] Research associates in the project were: Christopher Pak (King's Digital Lab, King's College London, UK, October 2017-April 2018), Zoe Schubert (University of Passau and University of Cologne, DE, November 2016-December 2017), and Michela Tardella (CNR-ILIESI, IT, July 2016-July 2017). Research assistants in the project were: Nils Geißler (University of Cologne, DE, April 2016-July 2018), Elli Reuhl (University of Cologne, DE, November 2016-July 2018), and Julia Sorouri (University of Cologne, DE, January 2017-July 2018).

for the complexity of cultural objects studied in the humanities and the theories that underpin these studies; it is central to most humanities and cultural studies and a perfect example of the variety of subject specific approaches that can inform modelling activities. An interesting attempt to integrate models of textuality from several disciplines into a metamodel to chart and relate single models to each other is Sahle (2013). Sahle's metamodel acts both as a model of the phenomenon of textuality and as a model for working with texts in the sense of representing, transforming, and analysing them. Therefore, this metamodel can inform the development of text technologies, digitisation practices, and rules for transcription and annotation.

The hypothesis underpinning the project was that in DH research, implicit and explicit models of cultural phenomena are integrated into external metamodels, e.g. graphical representations, which often embed natural language. These metamodels are iteratively translated towards computable implementations via a variety of more or less formal models. The analysis of modelling practices of textuality aim at gaining new insights in the epistemology of modelling in order to address questions such as: How are theory and practice blended in these modelling efforts? What role do formal and informal metamodels play in translating models of cultural phenomena into implementations? What shared terminology can help us gain an integrative and non-reductive understanding of digital modelling? Can we define the methods of digital modelling informed by such an integrative and non-reductive approach?

The core activities of the project included the organisation of the international workshop described below, the publication of its proceedings within the present issue, the delivery of a co-authored monograph, and a series of interdisciplinary labs.[6] The co-authored monograph, the writing of which is currently in progress, aims at integrating the results from these core research activities with the outcomes from the workshop to establish a common ground for further theoretical and practical research.

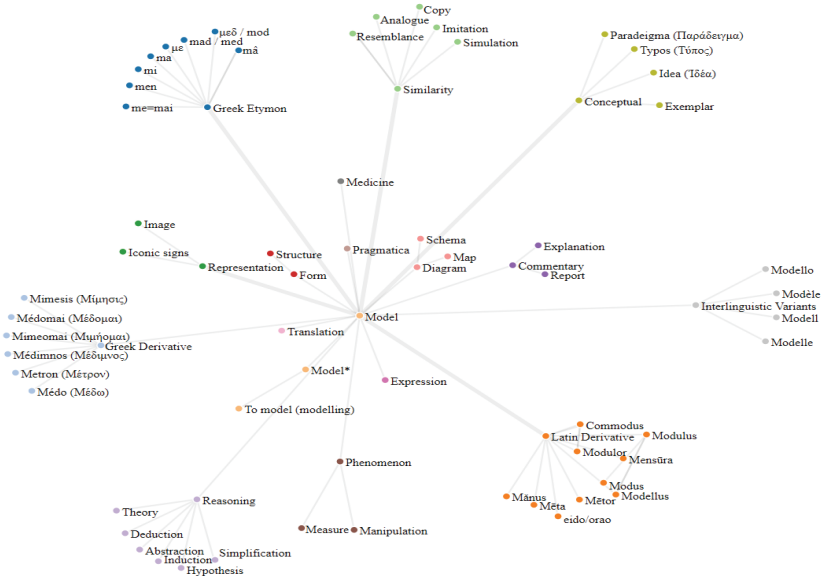
The project aimed at reflecting on two main concepts: textuality and events. While textuality mediates the world we live in, events are central to epistemological perception and description of the processes shaping this world. Under this umbrella three interdisciplinary labs were organised in Rome, at the Italian National Research Council's Digital Library, in 2016-2017: "I linguaggi della ricerca: parole e immagini" (The languages of research: words and images);[7]

[6] In addition, in 2016-2017, a total of 14 online and face to face project meetings as well as mutual research visits brought together the PIs and other team members. These meetings were held to reflect on and connect several research strands and to plan the project activities and its main deliverables.

[7] Lab 1: *Riti, Passaggi, Visioni, Linguaggi* (Rites, Passages, Visions, Languages), 21 March 2016; Lab 2: *Navigare la Ricerca* (Navigating Research), 26 September 2016; Lab 3: *Naufragi e Terre Nuove* (Shipwrecks and New Lands), 22 May 2017. See <http://modellingdh.eu/index.php/events/> for further details.

these events were part of Cristina Marras' research line and teaching programme. The aim of these labs was to investigate the heuristic and cognitive role that selected conceptual metaphorical models, belonging to the traditions of Western thought, assume in structuring knowledge. Groundwork from philosophy, literary studies, history and linguistics was combined with cultural heritage documentation and media studies methodologies. While not directly engaged with digital modelling, the Rome labs paved the way for further research for which funding will be sought.

Figure 1: Snapshot Drawn on Preliminary Network Graph of Terminological Connections Developed in D3.js (see Pak 2018), Slightly Reworked by Nils Geißler

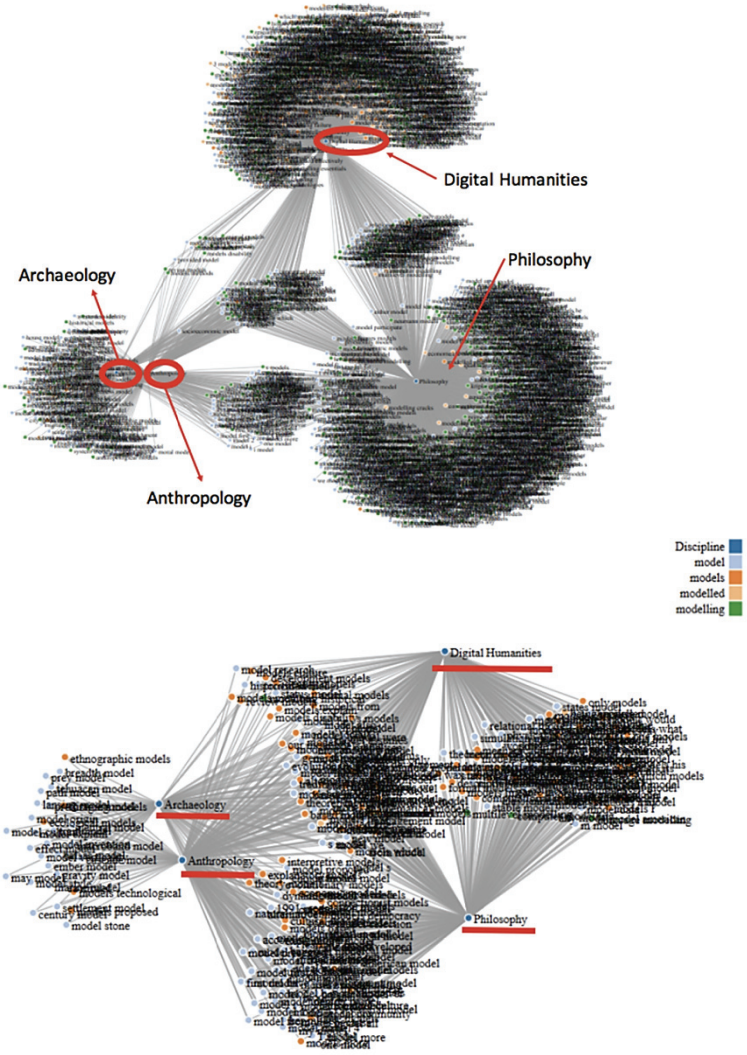


As complementary research strands to the core activities of the project, each PI hired postdoctoral researchers and student assistants to conduct some of the project research or to support its activities, and to free the PIs' time from other duties.

In particular, the Italian partner (Marras and Tardella) engaged in terminological and lexicographical research conducting a preliminary analysis of the terms "model" and "modelling" from a terminological and etymological perspective. The work was based on the assumption that the theoretical issues around modelling are deeply connected to the evolution of the relevant terminology, and that by reflecting on the terms and their relations a complex terminological network of underpinning concepts can be built. Based on the map-

ping of selected dictionaries, encyclopedias and etymological vocabularies to support this analysis, preliminary results confirmed that the complexity pertaining to theory and practices in modelling is embedded in the history of the terms "model" and "modelling". This work complemented ongoing research carried out in London and Cologne and offered a basis for further analysis and visualisations, undertaken by Pak (see Figure 1) and by Geißler.

Figure 2 and 3: Preliminary view of interdisciplinary connections developed in D3.js (Pak and Ciula 2018)



The UK partner (Ciula and Pak) developed a preliminary workflow for corpus linguistics research to process and analyse academic articles from five disciplines, published from 1900 to 2017. The workflow describes the parameters and methods for constructing and analysing a corpus of journal articles accessed via the JSTOR Data for Research service using corpus linguistics methodologies. Indicative findings show that model/ling is a networked term insofar as it co-occurs with semantically related terms defining structural relations between entities, such as "pattern" and "hierarchy." These preliminary findings provide the context for more extensive analysis into disciplinary-based discourses on the creation and use of models. Pak also developed visualisations to represent the results of this analysis.

The Cologne partner (Sahle, Geißler and Sorouri) worked at a case study on text models and model visualisation, based on a selective interdisciplinary literature survey on models for texts which led to a chapter in the project's monograph. Sorouri's contribution consisted of the translation of abstract or verbal models into new forms of visual representations which have been used in these proceedings and the forthcoming book.

The other German partner (Eide and Schubert) focused on the study of the connections across modelling, cultural heritage, and intermediality. Partly connected to cultural heritage (for instance, archaeological evidence) and partly connected to teaching, especially in the area of media modalities and virtual reality, Eide's research informed and has been complemented by Schubert's PhD on theatre in virtual reality.

In addition to the core activities mentioned above, the PIs and other team members gave numerous presentations at relevant conferences and events[8] to discuss the project premises and disseminate its findings. Either as a result of these conference contributions or other research connected to the project, several publications have appeared or are forthcoming (Ciula and Marras 2016; Ciula and Eide 2017; Ciula 2017a and 2017b; Ciula and Marras 2018 and forthcoming).

4. A Multidisciplinary View on Modelling: The Project Workshop

This Supplement of HSR stems from the contributions on modelling presented at the workshop "Thinking in practice", held at Wahn Manor House in Cologne on January 19-20, 2017. Practical examples of model building from different disciplines are presented and discussed, with the aim of contributing to the discussion of modelling in different disciplines, centered around DH as point of

[8] For more details see <http://modellingdh.eu/index.php/events/external-events>.

departure. Combined with theoretical considerations, the collection illustrates how the process of modelling is one of coming to know, in which the purpose of each modelling activity and the form in which models are expressed has to be taken into consideration in tandem. The modelling processes presented in this volume belong to specific traditions of scholarly and practical thinking as well as to certain political contexts. The claim that supported the project workshop was indeed that establishing connections between different traditions of and approaches towards modelling is vital, being these connections complementary or intersectional. To underpin the project research aims was indeed crucial to examine the nature of epistemological questions addressed in the different traditions and how they relate to the nature of the modelled objects and the models being created. While this is only touched upon in this volume it will be further developed in the forthcoming monograph co-authored by the project principal investigators.

This collection is an attempt to move beyond simple representational views on modelling in order to understand modelling processes as scholarly and cultural phenomena in themselves.

As the objects being modelled take active part in the relational process of several modelling efforts, their identities and properties are affected by the specificity of each modelling process, modified by the context of production and use of modelling processes. The insights that models provide about a specific phenomena can be of different nature; the goal of this issue is to show in practice how different modelling approaches operate in relation both to their contexts of production and use and in relation to each other.

Already at project proposal stage, comparisons and exchange across disciplines, within and beyond the humanities and cultural studies, were deemed crucial to establish an integrative concept of modelling within the project and inform an understanding of what draw us towards (digital) modelling, of how and what can we learn by modelling, and of how modelling changes our perceptions and conceptualisations.

Indeed, while rooted in the disciplinary context of DH, some of the project research activities examined the role of modelling and models in designing ways of knowing (epistemologies) and being (ontologies) in other selected disciplines. In particular, the workshop on which these proceedings are based was conceived as a means to reach out and benefit from a wide range of disciplines and traditions. Examining the capacity of modelling practices to develop "trading zones" that foster interdisciplinary exchange was paramount to the project's original perspective and goal. The international workshop Thinking in Practice was proposed as a catalyst to achieve this aim.

Scholars who are engaged with modelling or are contributing to the scholarly debate on modelling were invited to participate to the workshop at Wahn Manor House, so that diverse areas of expertise and disciplines were represented. Philosophy, Semiotics, Digital Humanities, Computer Science, Archaeolo-

gy, Geography, Literary and Intermedia Studies, Psychology, Educational Studies, Classics, Information Studies and Software Engineering were the research areas represented at the workshop. 24 participants attended the two-day interdisciplinary workshop and 13 speakers presented their perspectives and ideas concerning modelling. To facilitate the sharing of ideas in a creative and stimulating way, contributions were framed within a dialogic format which was complemented by guided practical exercises in which participants were asked to reflect upon their own positions in a less conventional yet structured way.

One of the aims of the workshop was to engage in a critical comparison of approaches focusing on modelling rather than models. This included presenting concrete practical modelling exercises as well as theoretical considerations from a number of different disciplines. The comparison had the ultimate objective of opening up the discussion to identify emerging aspects transferrable across disciplines. It was also an aim to challenge our views and modify and enrich them based on exchanges with colleagues from other fields and trained in different traditions, culturally and linguistically as well as disciplinary. Therefore, the concepts of model and modelling that merge from this volume presents very different theoretical and methodological perspectives. The resulting set of papers offers a view on these concepts that supersedes some of the most common assumptions in history and philosophy of science, whereby the manipulation of models is given primary focus. Indeed, one of the objectives of our project was to investigate the creative process of thinking at play in modelling practices, and how the manipulation of models interfaces with other acts of signification and reasoning are often highly facilitated by the use of metaphors. These proceedings are instrumental in presenting a discussion on the use of formal and informal languages in the process of modelling, in particular within research contexts in the humanities, engineering, and computer science.

The organization of this volume reflects the structure and the organization of the workshop itself. To facilitate the interdisciplinary dialogue we asked each participant to address a series of questions and respond by sharing a written "position paper". In addition, each participant was assigned a respondent so as to stimulate further discussion. This format is retained in the papers collected here, whereby each paper is followed by a short summary of questions and answers. The questions circulated to participants in preparation for the event were the following:

a) "What are the main challenges in the language around modelling?"
b) "What is the role of analogy, similarity, visuality, and iconicity in modelling?"
c) "Where would you position modelling on the imaginary axis theory/practice?"
d) "Do you see modelling as a core method in your discipline?"

These questions aimed to integrate theoretical approaches with practical methodologies in the study and application of models and modelling.

The opening of the workshop also followed interactive format. The presentation of the workshop scope and objectives was performed as a dialogue in which themes, aims and participants were narrated and described "as if" from a theatrical stage (see Appendix in this introduction). Arianna and Oyvind, respectively a cat and a fox, set up the context of the workshop including the agenda for the two days, and introduced each participant as well as the group of organisers, explaining the aims and the objectives of the meeting. The dialogue was intended as integrated part of the event by setting the context for a common methodology. It was based on the understanding that in such a multidisciplinary context, it was important to de-academicise the communicative structure and to be open to different languages, modalities and codes of interaction and discussion. Furthermore, the lexicon and metaphors adopted in the "dialogue" reveal the multidimensionality of the concept of model while also explicitly referencing the strengths of each invited participant.

In order to stress the importance of the role of each pair of speaker and respondent, of their exchange and of their cross-disciplinary contributions, each participant received as his or her badge a puzzle piece[9] matching the one of their paired "companion". The joint between the pieces of the puzzle were meant to symbolically represent the articulated composition and complexity characterizing the workshop as a meeting of minds.

To further enhance the exchange and benefit from the encounter amongst participants, we decided to combine the discussion with more playful activities in the form of interactive exercises. The exercises were intended to develop and stabilise each workshop participant's position with respect to the topic been discusses, as well as to grasp the most salient concepts or elements emerging during the paper sessions. To guide this part of the work we used two interrelated metaphors: the ship and the island. Aquatic or maritime as well as terrestrial metaphors were adopted. Indeed, these conceptual metaphors are highly interrelated, particularly in the discourse around research, research investigation, and knowledge organisation. They have developed into commonly accepted models vehiculating, structuring and mapping knowledge in research discourses. They are also key metaphors in DH. For example, the use of the tree metaphor is adopted extensively in the creation of taxonomies and schemes of knowledge and has been taken up as a common way of seeing textual structures, while the use of maritime metaphors such as "navigation" and "net" is central in the discourse around the web more generally. The properties of these metaphors adequately captured the nature of the workshop discussion: the fluid dynamic exchange facilitated at the event; an investigation around modelling as

[9] See the contribution of C. Marras (2018) in the Focus section of this volume.

both an analysis of the surface and a plumbing of the ocean depths; the importance of the organization of a ship, where everybody contributes to successful navigation (from the chef to the skipper, from the common sailor to the officers or the mechanic); the centrality of the on-board equipment (many things are needed: food, scientific instruments, etc.); and the differing expertise and roles of the crew. The route of a ship is traced up front, but subsequently adjusted during navigation to cope with the many unforeseen events at sea. The workshop was structured as an expedition, a navigating out to explore the open sea.

Altogether, the present volume reflects particular research interests in current studies of modelling. The contributors have connected their papers to dominant scientific debates around modelling concepts, but at the same time introduced original perspectives compared to the vast literature on the subject. The growth of knowledge, the cross-disciplinarity, the incipient cooperation between approaches and expertise on models and practices of modelling is therefore what is thematized in this issue.

This issue is divided in two parts: section 1 includes the 12 paired peer reviewed papers presented at the workshop, whereas section 2 is a Focus section where specific topics that arose during the workshop are discussed and analyzed. The Focus section complements the Articles section and it is intended to discuss, highlight, and reflect on some of the issues and methodological aspects that emerged from the two-day workshop. It focuses on key issues around modelling (Patrick Sahle, *How to recognize a model when you see one. Or: Claudia Schiffer and climate change*), methodologies and languages (Cristina Marras, *A metaphorical language for modelling*) as well as organizational and logistic aspects (Zoe Schubert and Elli Rehul, *Setting the space: Creating Surroundings for an Interdisciplinary Discourse and Sharing of (Implicit) Knowledge*). Moreover, two contributions are dedicated to the analysis of the concepts and definitions emerging from the papers and discussions as they were recorded using an observational grid. This grid was designed for the workshop and was filled in during the different sessions (Nils Geißler and Michela Tardella, *Observational drawings. From Words to Diagrams.*). An "external" view on the meeting from a participant who were neither a speaker nor an organizer completes the Focus section (Tessa Gengnagel, *The Discourse about Modelling: Observation from a participant*).

The 12 papers of Section 1 were written and shared in draft form as part of the preparation for the workshop and reviewed for the purpose of this publication. Each of them also includes responses based on the workshop discussions. As outlined above, by inviting experts from a variety of disciplines, the project team brought together diverse, complementary and sometimes conflicting theoretical views on and practical experiences with modelling. Some very crucial questions for scholars working on modelling and on what underpins the practice of modelling from an interdisciplinary perspective were asked by

Willard McCarty, a key figure in establishing the foundations for the concept and practice of modelling in DH. In his *Modelling what there is: Ontologising in a Multidimensional World*, McCarty addresses the question of interdisciplinarity in an epistemic and constructive way: "disciplines are not places of arrival, clubs to be joined, identities to assume or platforms of visibility, but starting-points". In *Models, modelling, metaphors and metaphorical thinking – from an educational philosophical view*, his paired speaker, Nina Bonderup Dohn, an expert in education studies and processes of design, presents her view on models within educational research defining models as "instruments for configuration and reconfiguration". She refers to Paul Ricoeur's claim that metaphors and metaphorical thinking overcome the conventional analysis of metaphors inherited from Aristotle, also known as the "substitution model", and see figurative language as the primary vehicle for the disclosure and creation of new forms of meaning.

That models are necessary for thinking is the radical position taken by Barbara Tversky, from the perspective of cognitive psychology. In her *Multiple models. In the Mind and in the World* she takes elements and relations among models in the represented world and map them onto elements and relations in the representing world. Spatial models representing, for instance, gesture rely on more direct and accessible mappings to meaning than language, which bears only arbitrary relations to meaning. Her paired speaker Christina Ljungberg, on the other hand, bringing in her work in the area of iconicity in language and literature, discusses the relationship between modelling, reasoning, and creativity. With examples from picture viewing, map reading, and mental diagrams in verbal language, in *Iconicity in cognition and communication,* she argues that iconicity is essential to reasoning, communication and mutual understanding.

Modelling is ubiquitous in the humanities: the search for patterns and principles, and the links between them, is found in all humanistic disciplines and periods. The debate around this assumption is represented by two papers: *Modelling in the Humanities: Linking patterns to principles* by Rens Bod in which some commonalities between modelling in the humanities and in the sciences are discussed and different modelling strategies and practices explored. In *Modelling in the Digital Humanities: a Research Program?*, Fotis Jannidis focuses on the different research fields were the term modelling is used, under the assumption that is hard to defend that they are all conceptually connected. Jannidis proposes to collect examples of different practices, in order to determine, which have essential communalities.

The specificity of modelling practices in archeology is discussed from a theoretical perspective by Oliver Nakoinz in his *Models and modelling in Archaeology,* where the author stresses the importance of a "trans-disciplinary modeling" framework for archeology, a discipline often challenged by conflicting attitudes towards the creation and use of models.

From his broad and cross-disciplinary perspective and cartographic practices, Gunnar Olsson provides an eclectic excursus in which the dialectic interplay between ethics and aesthetics, two sides of the same coin, guide us throughout his *EVERYTHING IS TRANSLATION (including the art of making new boots out of the old ones)*. A semiotic perspective in the framework of Charles S. Peirce's theory of signs is introduced by his paired speaker Claas Lattmann in *Iconizing the Digital Humanities. Models and modelling from a semiotic perspective*. In this contribution models are considered as icons; the fact that models are not identical to the things they represent (and that they represent only partially) are the true basis for genuine creativity and progress in research.

From the field of engineering and computer science, Giorgio Fotia and Paul Fishwick discuss how modelling represents a core method of investigation in the sciences. Fotia, with his paper *Modelling practices and practices of modelling,* proposes the concept of computing as an instrument for discovery in the sciences and as a useful metaphor to reflect upon when trying to unify the description of the practices of modeling across many different domains. Fishwick, in his original perspective on *Information modelling of the Humanities,* claims that the idea of information and information processing is part and parcel with the humanistic tradition and that written and pictorial languages can be used as basis for formalizing information and models.

Models in computer science and in digital humanities were the focus of Günther Görz, *Some remarks on modelling from a Computer Science perspective* and Francesca Tomasi, *Modelling in the Digital Humanities: Conceptual data models and knowledge organization in the cultural heritage domain*. Görz addresses a key point in his reflection on models and modelling: the distinction between models *of* and models *for*: "One of the basic tasks of computer science is to rewrite models derived from other scientific disciplines so that they can be represented and processed on computers." This makes the practice of modelling in a research software engineering context an inherently interdisciplinary undertaking. Francesca Tomasi sees data models as knowledge organization systems which are at the core of the Digital Humanities domain. In her paper she adopts a multi-dimensional vision: models are seen as processes of abstraction, as interpretations, and as formal languages to implement such abstractions in order to create something processable by a machine.

When taken together, the 12 papers provide an interdisciplinary insight into the relationship between model and modelling. A dense intertextual structure pervades this volume. The reader is invited to follow the threads through the different contextualisations and analyses of models by linking the papers with a broader theoretical approach to modelling with the ones which are case-studies oriented.

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A Multidisciplinary Perspective"

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Görz, Günther. 2018. Some Remarks on Modelling from a Computer Science Perspective. *Historical Social Research Supplement* 31: 163-9. doi: 10.12759/hsr.suppl.31.2018.163-169.

Jannidis, Fotis. 2018. Modeling in the Digital Humanities: a Research Program? *Historical Social Research Supplement* 31: 96-100. doi: 10.12759/hsr.suppl.31.2018.96-100.

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Appendix: The Dialogue

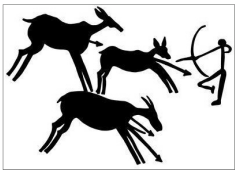
Photo 1 and 2: The Fox and the Cat

The stage is set. A castle, it is called; in reality more of a mansion. A place of illusions, of double addressing and complex references. The site of a theatre museum. A castle in which pizza is served from cardboard boxes. Illusions and fictions. Something pretending to be what it is not, something standing for something else. Models and stories, multiple levels of signs.

Two persons pretending to be what they are not. Gesturing to their demonstrable incapability to be actors, they stand there as objects for the gaze of an audience not yet aware of its composition nor of the rules of the game. Objects trying to take the lead as subjects, trying to mark the setting, using masks and pretence.

They try to de-academize an academic setting, using the memory of the place to bring back what could have been different. Their play was easily seen through. In self defence they made themselves openly vulnerable. A fox. A cat.

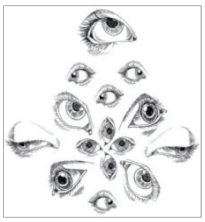
And what is an actor if not a model representing the world view of the author and the stage director? All models, models everywhere; not only the workshop but the whole project is already threatened with a total breakdown into a meaningless all-encompassing concept of models. Even a cave painting is a model. What about the cave itself? Where to start? How to sort out this mess?



Have mercy on them. Give them a voice, let them try to explain.

- Why are we here? What do we expect from you? We will not spend much time on this introduction, but still: where can we start?
- From the beginning perhaps? From where the project came to be?
- Yes. We kept talking about modelling, we talked a lot, both of us, but always came back to modelling, like the centre of a rosetta. We did not just talk, we were also inspired by reading works of wise people in Digital Humanities.
- Like Willard, your PhD supervisor and my missed teacher.

- Yes, him of course. The word was polysemous but we were not scared. Maybe a bit too cocky sometimes. And with fixations, like jotting things down, creating short texts describing all sorts of weird things. You know.
- We had some ideas about how to juggle slippery concepts like modelling. We had some disagreements too. We saw the Volkswagen Foundation call, the deadline closed in on us and instead of it wooshing by we jotted down something and drew together our dream team. Remember?
- How old do you think I am? Of course I remember. Cristina and Patrick.
- And they said yes! We knew already then that they would go for the best research assistants, hiring Michela, Nils, and Julia.

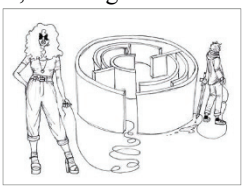


- Well, how could they say no to you? We also got a lot of support from my colleagues in Passau and Jonas came here to take part in the fun. What we did not know then was that Zoe and Elli would make it all even better. Thinking with more eyes was what we needed in order to expand our horizons and see in multiple dimensions.
- What we did not yet know was that the Volkswagen Foundation would decide to fund our project! Thanks Vera!
- We were ambitious and uncertain; we still are, I guess we will always be, but we also knew it was worth the challenge. Digging into what people mean and meant by modelling and how they use it, both the words and the activity. Draw some lines to follow, finding a way. Our way.
- Yes and going beyond Digital Humanities, peeping out at the vastness of the open sea. Where to start?

- We knew we could stay in the *mare nostrum* more or less comfortably and that's why the project has case studies on modelling texts and modelling events – the case studies will be challenging but we wanted to make sure we could draw from others beyond the team and beyond Digital Humanities.
- To be frank the interdisciplinary workshop idea was to seek inspiration but also to make sure we had stars to orient by when we sail out to see coastlines we did not yet know. So much new. So much happening. So much to understand. It takes a village to bring up a researcher.
- We tried to be brave. We wanted to catch a glimpse of the same feeling we had when reading Gunnar's book *Abysmal*.
- Yes, grounded but ready to fly. You can't be grounded without references and you can't fly or navigate without pointing ahead.
- Thanks to an important team effort we managed to get people here that could ground us in different ways; whether in an archaeological pit holding Oliver's hand or in a gesture following Barbara's route descriptions –

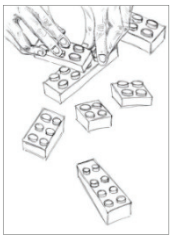
which in many ways stand between texts and maps, as manuscripts in general stand between the spatial and the textual.

- Indeed, and like Anton Ego in *Ratatouille*, all we want is some perspective. Rens can give us some looking back, forward and sideways at the history of the Humanities. Fotis will unflatten texts, building a statistics of wonders.



- Günther by taking us down and up in the labyrinths where artificial intelligence meets computer sciences through the practice of museum curators using WissKI.
- Giorgio would weave the threads where soft and hard sciences are made of the same wool.

- I don't like hard and soft but wool is cool. Paul knows how to make modelling of artworks talk with computing. Francesca spins the wheel of knowledge representation.
- And Nina talks to and with people, young people, those who will come after us and for whom modelling and design could make a difference in life. A difference for life to come. A part of their cultural capital if we take our responsibilities seriously.
- Yes, because ultimately modelling for us is a way or many ways of making sense. Understanding modelling is part of a diverse cultural literacy one should master, as citizen in a democracy. Show the kids they can model – and then we can learn from playing with models together.
- Claas and Christina will dare to hold some icons, a special type of icon via which we make sense of the world.
- (If I understand what an icon is tomorrow night I will be happy – and probably a bit sad too. If not, it is not their fault). Make sense of the world? Or the many worlds?
- Whatever helps us reason, playing with the blocks, building new things, making sense of the old ones.

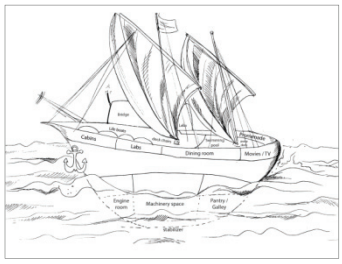


- I don't remember where it came from exactly but in Krakow we realized the modelling qualities of the Danish wonder tool for thinking with your hands, playing with brick models. [pause] We finally got to our Lego then!
- Well, Lego is not to be talked about, and workshops are not about introductions. It is about time.

Turning to the audience the fox expresses the hope that they have given at least a vague idea why each and every one in the room are invited.

The false modesty of the false animals stays until the end.

Leaving the pseudo-fiction they move over to their appointed roles in life and break the spell through a final short academic presentation of the project "Modelling between digital and humanities: Thinking in practice," its aims, participants, and methodology.



Through an intense two-day agenda with formal and informal talks, with exercises and shared meals, the specific setting of this event will release a shared potential among and between the participants. This, at least, is the hope of the organizers. The dream of the organizers. What the organizers need in order to find a way in the chaos of concept explosions.

Look at them, a last glimpse, up there with the silly masks in their hands and their futile hopes for clarity. Have mercy on them. Try to help them. Give them your best and maybe they will be able to walk around and across the abysses towards the unknown land of their dreams.

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Historische Sozialforschung

All articles published in HSR Supplement 31 (2018):
Models and Modelling between Digital Humanities – A Multidisciplinary Perspective

Arianna Ciula, Øyvind Eide, Cristina Marras & Patrick Sahle
Modelling: Thinking in Practice. An Introduction.
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Willard McCarthy
Modelling What There Is: Ontologising in a Multidimensional World.
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